

MagTag Modular Interfaces for Palletized Subsystems and Satellites, Phase I

Completed Technology Project (2018 - 2019)



Project Introduction

MagTags™ are a modular interface solution utilizing solid state switchable magnets and ferrous target materials to create a secure electrical or low-pressure fluid connection between modules and spacecraft with no moving parts. This switchable electropermanent magnet (EPM) requires no holding power, providing benefits over both standard permanent magnets and electromagnets. The proposed innovation allows for simplified repair and upgrade of NASA and commercial on orbit long duration assets by using MagTag-equipped plug-and-play modules such as batteries or reaction wheel systems. As currently envisioned MagTags fit within a 60mm x 60mm x 25mm volume making them compatible for use on cubesats and smallsats.

During the proposed Phase I effort, Altius will develop requirements for the MagTag, review the requirements and the resulting MagTag conceptual design at a workshop at the Small Satellite Conference, and then using feedback from that workshop, Altius will design, build, and test several brassboard prototypes of the MagTag Electrical interface, raising the system from a TRL 2 to a TRL 5. In Phase II Altius proposes doing detailed flight design, analysis, and space environment qualification testing of the MagTags, working with a satellite component provider to develop at least one representative MagTag-equipped module, and developing a preliminary design and prototype of a pallet for carrying multiple MagTag-equipped modules on Altius's BullDog™ satellite servicing vehicle. This will raise the MagTag TRL to 6 by the end of Phase II, with the potential to reach TRL 9 via flight demonstration subsequently.

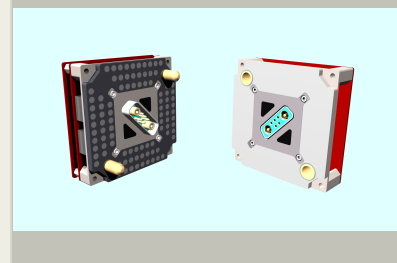
Anticipated Benefits

NASA Applications include:

- Power/Data modular interfaces for servicing (expansion, repairs, or upgrades) future NASA satellites and space facilities.
- Internal and external power/data interfaces for payloads and robot mounting for space facilities like the proposed LOP-G.

The main potential non-NASA applications for MagTags are:

- Modular interfaces for expansion, repair, or upgrade of cubesats, microsats, larger spacecraft, and persistent space platforms and other in-space assembled structures.
- Internal and external power/data interfaces for payloads and robot mounting for future commercial space facilities.



MagTag Modular Interfaces for Palletized Subsystems and Satellites, Phase I

Table of Contents

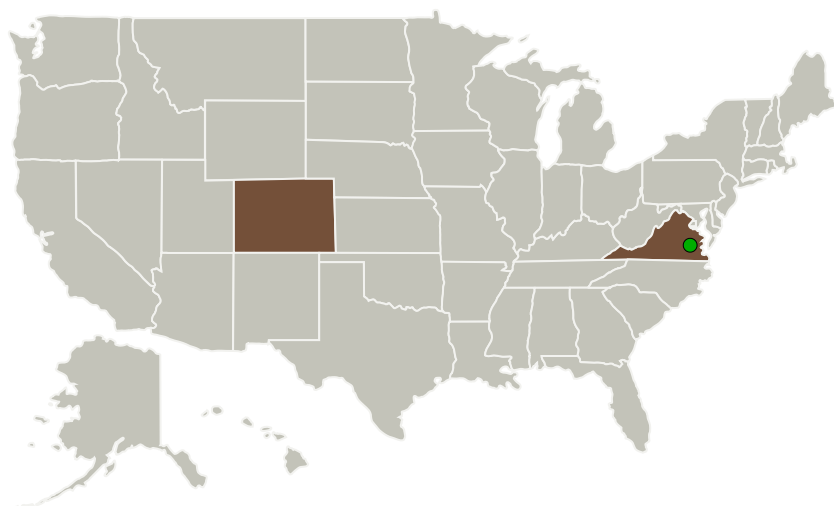
Project Introduction	1
Anticipated Benefits	1
Primary U.S. Work Locations and Key Partners	2
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Images	3
Technology Maturity (TRL)	3
Technology Areas	3
Target Destinations	3

MagTag Modular Interfaces for Palletized Subsystems and Satellites, Phase I

Completed Technology Project (2018 - 2019)



Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Altius Space Machines, Inc.	Lead Organization	Industry	Broomfield, Colorado
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations

Colorado	Virginia
----------	----------

Project Transitions

**July 2018:** Project Start**February 2019:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/141169>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Altius Space Machines, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Joshua Nelson

Co-Investigator:

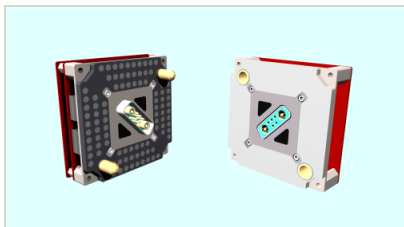
Joshua Nelson

MagTag Modular Interfaces for Palletized Subsystems and Satellites, Phase I

Completed Technology Project (2018 - 2019)



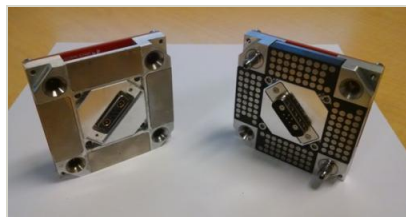
Images



Briefing Chart Image

MagTag Modular Interfaces for Palletized Subsystems and Satellites, Phase I

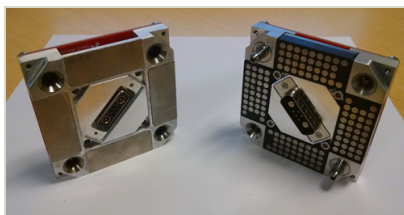
(<https://techport.nasa.gov/image/129613>)



Final Summary Chart Image

MagTag Modular Interfaces for Palletized Subsystems and Satellites, Phase I

(<https://techport.nasa.gov/image/133879>)



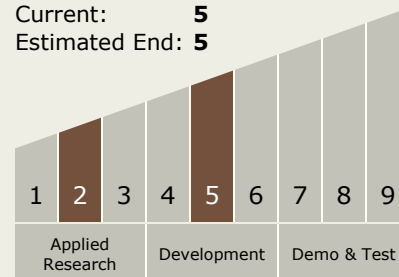
Final Summary Chart Image

MagTag Modular Interfaces for Palletized Subsystems and Satellites, Phase I

(<https://techport.nasa.gov/image/134322>)

Technology Maturity (TRL)

Start: 2
Current: 5
Estimated End: 5



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - TX12.4 Manufacturing
 - TX12.4.2 Intelligent Integrated Manufacturing

Target Destinations

Earth, The Moon, Mars